UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,511	06/27/2001	Mamoru Nakasuji	010819	8779

38834 7590 08/25/2005

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER	
BERMAN, JACK I	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 08/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/891,511	NAKASUJI ET AL.	
	Examiner	Art Unit	
	Jack I. Berman	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 14 July 2005 and 12 August 2005.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 17-59 and 61-74 is/are pending in the application.

4a) Of the above claim(s) 17-59 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 61-74 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 October 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 61 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,665,968 to Meisburger et al. in view of U.S. Patent No. 4,137,476 to Ishii et al., U.S. Patent No. 6,765,217 to Nishimura et al., U.S. Patent No. 4,803,358 to Kato et al., U.S. Patent No. 6,315,512 to Tabrizi et al. and U.S. Patent No. 5,536,128 to Shimoyashiro et al. Meisburger et al. discloses an inspecting apparatus for inspecting an object to be inspected by irradiating charged particles onto said object to be inspected, said apparatus comprising: a working chamber for inspecting said object to be inspected, said chamber capable of being controlled to have a vacuum atmosphere (see the section labeled VACUUM SYSTEM beginning at line 52 in column 19); a beam generating means for generating said charged particles as a beam (see lines 14-23 in column 9); an electron optical system including an objective lens (104) for guiding and irradiating said beam onto said object to be inspected held in said working chamber, detecting secondary charged particles emanated from said object to be inspected and introducing said secondary charged particles to an image processing system (see lines 23-64 in column 9); an image processing system for forming an image by said secondary charged particles (see sections labeled VIDEO FRAME BUFFER and IMAGE DISPLAY in column 18); a data processing system for displaying and/or storing status information of said object to be inspected based on output from said image processing system (see the sections labeled DEFECT PROCESSOR in column 14 and POST PROCESSOR in column 18); a stage device (24) for

operatively holding said object to be inspected so as to be movable with respect to said beam; a carrying mechanism for securely accommodating said object to be inspected and for transferring said object to or from said working chamber (see sections labeled SUBSTRATE HANDLER in column 19 and LOAD OPERATION starting in column 20); an alignment controller for observing the surface of said object to be inspected for the alignment of said object to be inspected with respect to said electron-optical system to control the alignment (see section labeled OPTICAL ALIGNMENT SYSTEM in column 21) wherein the alignment of said object to be inspected includes rough alignment; an E x B separator (Wien filter deflectors 112 and 113), having an electric field and a magnetic field crossing at right angles and including at least a pair of electrodes for generating the electric field and a pair of electrodes for generating the magnetic field. While Meisburger et al. uses a CCD camera with different magnifications for the rough alignment of the object to be inspected before a high magnification alignment for inspection is made by the electron optical system, the substitution of an optical microscope for the CCD camera would have been an obvious substitution of known equivalents. While Meisberger et al. teaches at lines 26-37 in column 19 that, in order to minimize complexity, the stage (24) should be limited to motion in the x and y directions with rotation of the field of view being accomplished by rotation of the electron beam, Kato et al. teaches at lines 10-26 in column 1 that movement of the stage of a scanning electron microscope, including rotation in the direction about the axis normal to the object supporting surface of the stage, is functionally equivalent to movement of the electron beam by adjusting an electron lens, as Meisberger et al. does, but has greater positional accuracy. The use of Kato et al.'s stage with rotational freedom of movement as well as freedom of movement in the x and y directions instead of Meisberger et

al.'s stage with freedom of movement in only the x and y directions and a means for electronically rotating the electron beam would therefore have been an obvious substitution of known equivalents. At lines 59-65 in column 9, Tabrizi et al. teaches to provide a mini-environment chamber (604) for supplying a clean gas to an object to be introduced into a working chamber to prevent dust from contacting the object, the mini-environment chamber including a gas supply unit including a cleaning filter such as a HEPA or ULPA filter for creating the clean gas, a loading chamber (load locks 406*a* and 406*b*) disposed between said mini-environment chamber and the working chamber (process chamber 410), and adapted to be independently controllable so as to have a vacuum atmosphere, a loader having a carrier unit (atmospheric robot 404) capable of transferring the object between the mini-environment chamber and a loading chamber, and another carrier unit (vacuum transport robot 422) capable of transferring said object between said loading chamber and said working chamber. Tabrizi et al. does not describe the mini-environment chamber in detail, but does say at lines 39-44 in column 1 that such mini-environments may incorporate laminar gas flow. Shimoyashiro et al. discloses, at line 61 in column 9 through line 9 in column 10, that such mini-environments (clean box 50) may have downward laminar flows. It would have been obvious to a person having ordinary skill in the art to use the Tabrizi et al. loading system with the Shimoyashiro et al. mini-environment chamber to load the object to be inspected into the Meisburger et al. inspection system discussed above in order to avoid the contamination problem discussed by Tabrizi et al. and Shimoyashiro et al. At lines 8-25 in column 19, Meisberger et al. teaches to provide the disclosed inspection system with a pre-aligner (substrate handler 34) for aligning the orientation of said object to be inspected in a rotation direction about the axis of said object for rough

alignment thereof and it would have been obvious to a person having ordinary skill in the art to incorporate this pre-aligner into the Tabrizi et al./Shimoyashiro et al. mini-environment chamber discussed above. Ishii et al. discloses a thermal electron beam source including LaB_6 as a cathode, for use in electron beam devices such as scanning electron microscopes, the tip portion of which is formed into a cone shape. It would have been obvious to a person having ordinary skill in the art to use the Ishii et al. cathode as the beam source in the Meisburger et al. system because of the capability of emitting stable electron beams at high intensity for a long period of time that Ishii et al. teaches is a property of the cathode. At lines 32-33 in column 9, Meisburger et al. teaches that the primary optical system should be telecentric. Nishimura et al. discloses an inspection apparatus similar to Meisburger et al.'s wherein a primary optical system directs an electron beam through an objective lens to a sample and the resulting secondary electrons are formed into an image and detected. At lines 50-63 in column 8, Nishimura et al. teaches that the primary optical system should have a multi-stage multi-pole lens system (quadrupole or octapole lenses 44, 45, 46) for forming Koehler illumination. The substitution of Nishimura et al.'s optical system for that described by Meisburger et al. would have been an obvious substitution of equivalent parts.

Claims 62, 73, and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al., and Shimoyashiro et al. as applied to claims 61 and 64 above, and further in view of U.S. Patent No. 6,344,750 to Lo et al. Lo et al. discloses scanning electron beam inspection apparatus similar to Meisburger et al.'s. Lo et al. teaches, at lines 4-20 in column 7, to provide an electrode (charge control plate 30) between the objective lens (34) and the object to be examined (wafer 22) and to apply a voltage

to this electrode to control the electric field between the object and the objective lens. At lines 37-55 in column 6, Lo et al. also teaches to provide, along with the electrode (30), a precharge unit comprising a charged particle irradiating section (36) for irradiating low voltage electrons in advance against said inspecting region just before the inspection and, beginning at line 48 in column 9, explains in detail how precharging, along with the operation of the charge control electrode (30), removes variations of charge accumulated on an object under test. It would have been obvious to a person having ordinary skill in the art to apply this teaching of Lo et al.'s to the Meisburger et al./Ishii et al./Nishimura et al./Kato et al./Tabrizi et al./Shimoyashiro et al. apparatus discussed above by providing Lo et al.'s charged particle irradiating section in order to prevent the problems discussed by Lo et al.

Claims 66 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al. and Shimoyashiro et al. as applied to claims 61 and 64 above, and further in view of U.S. Patent No. 5,944,049 to Beyer et al. In the section labeled VACUUM SYSTEM, Meisburger et al. teaches to monitor the vacuum level in the working chamber and to provide an interlock mechanism (pressure sensors, computers 42 and 46, and pneumatic isolation valve 145) that executes an emergency control to secure the vacuum level at a safe level in the case of an irregularity. Beyer et al. teaches, at lines 6-19 in column 1, that it is known in the art to use a turbo molecular pump as a main exhaust pump (2) and a roots vacuum pump (3) as a roughing vacuum pump to exhaust a vacuum chamber of the type used for processing semiconductor devices. It would have been obvious to a person having ordinary skill in the art to use this known vacuum exhausting system to perform the required exhausting of the working chamber in the Meisburger et al./Ishii et al./Nishimura et

al./Kato et al./Tabrizi et al./Shimoyashiro et al. system discussed above. Use of this known exhausting system instead of the turbopump used by Meisburger et al. would have been an obvious substitution of known equivalents.

Claims 63, 65, and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al., Shimoyashiro et al., and Lo et al. as applied to claims 62, 73, and 74 above, and further in view of Beyer et al. as applied to claims 66 and 67 above.

Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al., Shimoyashiro et al., and Beyer et al. as applied to claims 63, 67, and 71 above, Lo et al. as applied to claims 62, 73, and 74 above, and further in view of U.S. Patent No. 4,911,103 to Davis et al. While Davis et al.'s load lock chamber (12) is not equivalent to the mini-environment chamber between the ambient environment and a loading chamber, Davis et al. does discuss the problem of contaminants that may be introduced into a vacuum chamber and teaches, at lines 10-24 in column 24, to provide a particulate sensor to monitor the cleanliness of a loading chamber. It would have been obvious to a person having ordinary skill in the art to incorporate such a sensor in the Tabrizi et al./Shimoyashiro et al. mini-environment chamber discussed above and shut down the inspection apparatus when the cleanliness of the mini-environment chamber is below a predetermined level since these references both recognize the problems caused by contamination and seek to avoid these problems.

Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al., Shimoyashiro et al., and Beyer et al. as

applied to claims 63, 67, and 71 above, Lo et al. as applied to claims 62, 73, and 74 above, and further in view of the English language abstract of Japanese Published Application Number 63-006737 to Furumiya (cited by Applicant in the Information Disclosure Statement filed on February 11, 2002). Lo et al. does not disclose the structural details of the electron flood gun (36) used in the precharge unit, but the abstract of the Furumiya patent teaches that such a precharge unit may comprise a UV lamp (14) that irradiates a quartz glass plate coated with a photoelectron emission material (8) for emitting photoelectrons. It would have been obvious to a person having ordinary skill in the art to use the Furumiya as the nominally recited electron flood gun cited by Lo et al. and to provide the coating directly on the lamp rather than on an additional piece of quartz glass so as to keep the unit more compact. The energy of the photoelectrons emitted would be an inherent function of the wavelength of the UV radiation emitted by the lamp and the material used as the photoemissive coating and this would have been a matter of routine experimentation so as to achieve the best charge neutralization.

Claim 70 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meisburger et al., Ishii et al., Nishimura et al., Kato et al., Tabrizi et al., Shimoyashiro et al., and Beyer et al. as applied to claims 63, 67, and 71 above, Lo et al. as applied to claims 62, 73, and 74 above, and further in view of U.S. Patent No. 4,607,167 to Petric and U.S. Patent No. 6,603,130 to Bisschops et al. Petric discloses a stage (30) for holding an object to be irradiated with a focused electron beam with a degree of freedom at least equal to or more than two with respect to the electron-optical system, said stage (30) comprising a non-contact supporting mechanism by means of static pressure bearings (see lines 10-15 in column 8), and a vacuum sealing mechanism (20) through differential pumping. It would have been obvious to a person having

ordinary skill in the art to use the Petric apparatus as the stage positioning equipment and evacuation devices required for the Meisburger et al./Ishii et al./Nishimura et al./Kato et al./Tabrizi et al./Shimoyashiro et al./Beyer et al./Lo et al. apparatus discussed above since the Petric apparatus is designed to permit the irradiation of objects with a focused electron beam of the type used by Meisburger et al. As can be best seen in Figure 4, Bisschops et al. teaches that when a static pressure bearing (21) is used to support a stage (14) that supports a wafer (W) inside the vacuum chamber (V) of a lithography system (2), it is advantageous to provide a partition (sliding seal plate 12) near the pressure bearing to minimize loss of vacuum. Since the Petric apparatus uses a pressure bearing as well as a partition near the electron beam generator, it would have been obvious to a person having ordinary skill in the art to apply the teachings of Bisschops et al. by providing an additional partition near the pressure bearing if the Petric apparatus is used as the stage in the Meisburger et al./Ishii et al./Nishimura et al./Kato et al./Tabrizi et al./Shimoyashiro et al./Beyer et al./Lo et al. apparatus discussed above in order to maintain the lowest pressure possible at the surface of the wafer under test.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack I. Berman whose telephone number is (571) 272-2468. The examiner can normally be reached on M-F (8:30-6:00) with every second Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jack I. Berman

Jack I. Berman
Primary Examiner
Art Unit 2881

jb
8/23/05